International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM 2018 vol.18 N2.2, pages 277-284

# Making the multicomponent model of earth latitude alternation using software package asrm-2017

*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

## Abstract

© SGEM 2018. The first results of using adaptive regression modeling (ARM-approach) in description of the latitude periodic change are analyzed. A multicomponent (polyharmonic) model of the latitude part observed dynamics containing between 14 and 21 harmonics requires interpretation and autoregressive forecasting of the 6th order providing high accuracy for the period of two years. This article provides the analysis, modeling, and forecasting of the latitude periodic change using the “Automated System for Robust Modeling” (ASRM-2017) package designed for geoprocessing and it is representing a system in which algorithms of time series analyzing and processing are implemented on the basis of adaptive regression modeling (ARM-approach). It is considered that in almost constant orientation of the Earth's rotation axis relative to “fixed stars” the Earth body moves around the axis of rotation. The points of intersection of the rotation axis with the surface of the Earth are geographic Earth's poles and they move on the Earth’s surface since the Earth oscillates relative to its axis of rotation. According to the accepted terminology, this phenomenon is called periodic motion of the Earth's poles. The amplitude of the pole “swinging” on the circumpolar surface can reach a few dozens of meters. This is a significant value for today's practical applications depending on the quality of coordinate and time support. Therefore, the motion of the poles will certainly be taken into account in modern navigation, astrometry, geodesy, etc. The work also deals with the correlation between the Earth's pole motion and strong earthquakes.

http://dx.doi.org/10.5593/sgem2018/2.2/S08.035

## Keywords

Adaptive modeling, Automated system for robust modeling, Geoinformatics, Harmonic analysis, Software packages, The polyharmonic model of latitude change

## References

[1] Lapaeva V.V., Meregin V.P. and Nefedjev Y.A., The Study of the Local Fluctuations of the Earth's Crust Using Data of Latitude Observations, Geophysical Research Letters, 32, L24304, 2005.

[2] Valeev S.G., Regressionnoe modelirovanie pri obrabotke nablyudenyi, Kazan: FAN, pp. 1-296, 2001.

[3] Varaksina N.Y., Nefedyev Y.A., Churkin K.O., Zabbarova R.R. and Demin, S.A., Lorentzian’ analysis of the accuracy of modern catalogues of stellar positions, Journal of Physics: Conference Series, Vol. 661, P. 012015, 2015.

[4] Nefedyev Y., Valeev S., Mikeev R., Varaksina N., A. Andreev. Analysis of data of “CLEMENTINE” and “KAGUYA” missions and “ULCN” and “KSC-1162” catalogues, Advanced in Space Research, 50, pp. 1564-1569, 2012.

[5] Usanin V., Nefedyev Y. and Andreev A., Use of long-term models for analysis of comet Encke's motion, Advances in Space Research, Vol. 58/ Issue 11, Pages 2400-2406, 2016.

[6] Nefedjev Y.A. and Nefedjeva A.I., Determination of refraction anomalies by global inclinations of airstratas of identical density, Astronomische Nachrichten, Vol. 326/Issue 8, pp. 773-776, 2005.

[7] Nefedjev Yu.A., Rizvanov N.G., The results of an accurate analysis of EAO charts of the Moon, AstronomoscheNachrihten, 323, pp. 135-138, 2002.

[8] Sokolova M., Nefedyev Y., Sergienko M., Demina, N. and Andreev, A., Analysis of the Lyrids' meteor stream structure for long timeslots, Advances in Space Research, Vol. 58/ Issue 4, pp. 541-544, 2016.

[9] Lapaeva V.V., Meregin V.P. and Nefedjev Y.A., The Study of the Local Fluctuations of the Earth's Crust Using Data of Latitude Observations, Geophysical Research Letters, 32, L24304, 2005.

[10] Lapaeva V.V., Meregin V.P. and Nefedjev Y.A., The Study of the Local Fluctuations of the Earth's Crust Using Data of Latitude Observations, Geophysical Research Letters, 32, L24304, 2005.

[11] Demin S.A., Panischev O.Yu. and Nefedyev Yu.A., Dynamic and Spectral X-Ray Features of the Micro-quasar XTE J1550-564, Kinematics and Physics of Celestial Bodies, 30, pp. 63-69, 2014.

[12] Sokolova M.G., Nefedyev Y.A. and Varaksina N.Y., Asteroid and comet hazard: Identification problem of observed space objects with the parental bodies, Advances in Space Research, Vol. 54/ Issue 11, pp. 2415-2418, 2014.

[13] Demin S.A., Panischev O.Yu. and Nefedyev, Yu.A., Auto-and cross-correlation analysis of the QSOs radio wave intensity, Journal of Physics: Conference Series, Vol. 661/ Issue 1, no. 012003, 2015.

[14] Sokolova M.G., Kondratyeva E.D. and Nefedyev Y.A., A comparative analysis of the D-criteria used to determine genetic links of small bodies, Advances in Space Research, Vol. 52/ Issue 7, pp. 1217-1220, 2013.

[15] Rizvanov N.G., Nefed'ev Yu.A. and Kibardina M.I., Research on selenodesy and dynamics of the Moon in Kazan, Solar System Research, Vol.41/ N 2, pp.140-149, 2007.